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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MEHRDAD NIKOONAHAD, ADY LEVY, KYLE A. BROWN, GARY BULTMAN, DAN WACK, and JOHN FIELDEN

Appeal 2008-1330
Application 10/670,183
Technology Center 2800

Decided: September 26, 2008

Before MAHSHID D. SAADAT, MARC S. HOFF,
and KEVIN F. TURNER, *Administrative Patent Judges.*

SAADAT, *Administrative Patent Judge.*

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134(a) from the Examiner's Final Rejection of claims 6633-6651. Claim 6652 has been objected to for being dependent upon a rejected base claim but otherwise allowable, while claims 1-6632 have been canceled. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm and enter a new ground of rejection pursuant to the provisions of 37 C.F.R. § 41.50(b).

STATEMENT OF THE CASE

Appellants' invention relates to a system configured to determine at least two properties of a specimen that are used to determine the characteristics of the specimen (Spec. 4). According to Appellants, the first property may include a critical dimension of the specimen, while the second property may include overlay misregistration of the specimen (Spec. 5). A critical dimension of a feature may include a lateral dimension such as a width, a vertical dimension such as a height, and a sidewall profile (Spec. 189). In addition, a thickness, an index or refraction, and/or an extinction coefficient of a layer of the specimen, and a critical dimension of a feature on the specimen may be determined (*id.*). An understanding of the invention can be derived from a reading of independent claim 6633, which is reproduced as follows:

> 6633. A system configured to determine at least two properties of a specimen, comprising:
>
> a spectroscopic ellipsometer configured to generate one or more output signals during measurement of the specimen; and
>
> a processor coupled to the spectroscopic ellipsometer and configured to determine a critical dimension and a thin film characteristic of the specimen from the one or more output signals.

The Examiner relies on the following prior art references:

Aspnes	US 5,900,939	May 4, 1999
Stanke	US 6,563,586 B1	May 13, 2003 (filed Jul. 10, 2000)

The rejections as presented by the Examiner are as follows:

Claims 6633 and 6635-6651 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Aspnes.

Claim 6634 stands rejected under 35 U.S.C. § 102(e) as being anticipated by Stanke.

We make reference to the Briefs[1] and the Answer[2] for their respective details. Only those arguments actually made by Appellants have been considered in this decision. Arguments which Appellants did not make in the Briefs have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii).

ISSUES

1. Under 35 U.S.C. § 102(b), with respect to the appealed claims 6633 and 6635-6651, does Aspnes anticipate the claimed subject matter by teaching all of the claimed limitations?
2. Under 35 U.S.C. § 102(e), with respect to claim 6634, does Stanke anticipate the claimed subject matter by teaching all of the claimed limitations?

FINDINGS OF FACT

1. Appellants' Specification, in reference to Figure 8, defines a critical dimension as:

> A critical dimension may include a lateral dimension of a feature defined in a direction substantially parallel to an upper surface of the specimen such as width 62 of feature 56 on

[1] We refer to the Supplemental Appeal Brief, filed on Apr. 4, 2005 and the Reply Brief, filed on Jan. 10, 2006.
[2] We refer to the Examiner's Answer, mailed Nov. 18, 2005.

> specimen 60. Therefore, a critical dimension may be generally defined as a lateral dimension of a feature when viewed in cross section such as a width of a gate or interconnect or a diameter of a hole or via. A critical dimension of a feature may also include *a lateral dimension of a feature defined in a direction substantially perpendicular to an upper surface of the specimen* such as height 64 of feature 56 on specimen 60. (Emphasis added).

(Spec. 74:17-23).

2. Aspnes discloses a "thin film optical measurement system with a wavelength stable calibration ellipsometer that precisely determines the thickness of a film on a reference sample." (Col. 2, ll. 41-44).

3. As depicted in Figure 1, "[c]omposite optical measurement system 1 includes a Beam Profile Ellipsometer (BPE) 10, a Beam Profile Reflectometer (BPR) 12, a Broadband Reflective Spectrometer (BRS) 14, a Deep Ultra Violet Reflective Spectrometer (DUV) 16, and a Broadband Spectroscopic Ellipsometer (BSE) 18." (Aspnes, col. 3, ll. 45-50).

4. The output signals which are based on the light reflected from the sample are sent to a processor 48. "As discussed in the U.S. Pat. No. 5,181,080, by monitoring the change in the polarization state of the beam, ellipsometric information, such as Ψ and Δ, can be determined. To determine this information, the processor 48 takes the difference between the sums of the output signals of diametrically opposed quadrants, a value which varies linearly with film thickness for very thin films." (Aspnes, col. 4, ll. 26-34).

5. "The processor 48 receives the output of the detector arrays 54/56, and derives the thickness and refractive index of the thin film layer 8

based on these angular dependent intensity measurements by utilizing various types of modeling algorithms." (Aspnes, col. 4, ll. 58-62).

6. As shown in Figure 1 of Aspnes, "[m]irror 72 focuses the beam onto the sample surface at an oblique angle, ideally on the order of 70 degrees to the normal of the sample surface." (Col. 5, ll. 49-52).

7. "The beam 106 is focused onto the sample 4 by lens 94 at an oblique angle. For calibration purposes, reference sample 4 ideally consists of a thin oxide layer 8 having a thickness d, formed on a silicon substrate 6. However, in general, the sample 4 can be any appropriate substrate of known composition, including a bare silicon wafer, and silicon wafer substrates having one or more thin films thereon." (Aspnes, col. 6, ll. 58-64).

PRINCIPLES OF LAW

1. Claim Scope

We determine the scope of the claims in patent applications not solely on the basis of the claim language, but upon giving claims their broadest reasonable construction in light of the specification as it would be interpreted by one of ordinary skill in the art. *In re American Academy of Science Tech Center*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). Absent an express intent to impart a novel meaning to a claim term, the words take on the ordinary and customary meanings attributed to them by those of ordinary skill in the art. *Brookhill-Wilk 1, LLC v. Intuitive Surgical, Inc.*, 334 F.3d 1294, 1298 (Fed. Cir. 2003).

"[T]he words of a claim 'are generally given their ordinary and customary meaning.'" *Philips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir.

2005) (en banc) (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)). Furthermore, specification is the single best guide to the meaning of a claim term. *Phillips v. AWH Corp.*, 415 F.3d at 1315 (Fed. Cir. 2005).

2. Anticipation

In rejecting claims under 35 U.S.C. § 102, "[a] single prior art reference that discloses, either expressly or inherently, each limitation of a claim invalidates that claim by anticipation." *Perricone v. Medicis Pharmaceutical Corp.*, 432 F.3d 1368, 1375-76 (Fed. Cir. 2005), citing *Minn. Mining & Mfg. Co. v. Johnson & Johnson Orthopaedics, Inc.*, 976 F.2d 1559, 1565 (Fed. Cir. 1992). "Anticipation of a patent claim requires a finding that the claim at issue 'reads on' a prior art reference." *Atlas Powder Co. v. IRECO, Inc.*, 190 F.3d 1342, 1346 (Fed Cir. 1999) ("In other words, if granting patent protection on the disputed claim would allow the patentee to exclude the public from practicing the prior art, then that claim is anticipated, regardless of whether it also covers subject matter not in the prior art.") (internal citations omitted).

ANALYSIS

1. 35 U.S.C. § 102(b) Rejection over Aspnes

Claims 6633, 6636, 6637, 6642, and 6645-6647

Appellants argue that the teachings of Aspnes related to measuring the thickness of a film are not the same as determining a critical dimension since the definition of "critical dimension," as stated in the Specification and accepted in the art, does not include a thickness of a film (App. Br. 4). Appellants further rely on page 74 of the Specification for describing a

critical dimension in terms of the lateral dimension of a feature defined in a direction either parallel or perpendicular to the upper surface of the specimen, as well as on various publications to demonstrate the accepted meaning of the term "critical dimension" in the art (*id.*). In response, the Examiner argues that, as defined by Appellants' own disclosure (Spec. 74:17-23), a critical dimension includes a lateral dimension of a feature in a direction perpendicular to the upper surface, which corresponds to a film thickness (Ans. 7-8).

We find that Appellants' description of the "critical dimension" in the Specification includes dimensions in both lateral and vertical directions with respect to an upper surface of the specimen (FF 1). Giving the claims their broadest reasonable interpretation in light of the Specification, we find that the claimed term does not preclude determining any dimension, such as a film thickness, that is critical for process precision. Similarly, contrary to Appellants' assertion (Reply Br. 2-3) that while not specifically recited, the claimed "a critical dimension" means "a critical dimension of a feature," such limitations cannot be read into the claims. Based on the breadth of the recited language in claim 6633 and the disclosed description of the term, we disagree with Appellants' argument that the claimed "critical dimension" requires the dimension be related to any specific feature or measurement in any specific direction. As such, consistent with the instant disclosure, thickness of a layer constitutes a critical dimension.

Appellants further argue that the processor 48 of Aspnes is configured to determine the *film thickness* of a specimen, not a *critical dimension* of the specimen (App. Br. 6). Based on our analysis above, we disagree and find that the processor 48 does indeed determine a critical dimension as the

thickness and the refractive index of the thin film layer 8 of a specimen using the beams reflected off the specimen (FF 2-5). Therefore, as Aspnes discloses all the claimed features of claim 6633, we sustain the 35 U.S.C. § 102(b) rejection of claim 6633, as well as claims 6636, 6637, 6642, and 6645-6647 which are argued together as one group (App. Br. 7) over Aspnes.

Claims 6635, 6649, and 6650

With respect to claim 6635, Appellants' arguments (App. Br. 7) reiterate the contention that the film thickness is not a critical dimension, which arguments we found to be unpersuasive as discussed *supra.* Appellants further argue that while Aspnes discloses a measurement system for performing measurements during a process, the reference does not teach or suggest that the measurement system is integrated into a process tool (App. Br. 7). The Examiner responds by pointing out that Aspnes discloses in Figure 1 a composite optical measurement system including an ellipsometer for determining the thickness and other characteristics of a thin film layer (Ans. 9). The Examiner further asserts that the processor, which is integrated with the system of Figure 1, is a process tool (*id.*). Appellants argue that the processor 48 is not a process tool (Reply Br. 3).

We do not find Appellants' arguments to be persuasive. While a process tool may be a very specific tool used in semiconductor manufacturing, the claims are not delimited to such process tools. Therefore, we find the Examiner's position that the claimed "process tool" reads on the processor 48 of Aspnes to be reasonable since the processor is a tool that provides the thickness measurement during the processing of the specimen (FF 3-5). Therefore, for the reasons discussed above, we sustain

the 35 U.S.C. § 102(b) rejection of claim 6635, as well as claims 6649 and 6650 which are argued together as one group (App. Br. 7-8), over Aspnes.

Claims 6638-6641

Appellants' arguments (App. Br. 8) reiterate the contention that the film thickness is not a critical dimension, which arguments we found to be unpersuasive as discussed *supra*. Appellants further assert that Aspnes does not teach or suggest a spectroscopic ellipsometer configured to illuminate a specimen at a normal angle of incident (App. Br. 8). Appellants refer to mirror 72 in Figure 1 of Aspnes and point out that the beam is focused on the sample at an oblique angle (*id.*). The Examiner responds by pointing out that Aspnes discloses in Figure 1 probe beams 24 and 26 that are generated by laser 20 and light source 22 and illuminate the sample 4 at a normal angle of incident (Ans. 10). Appellants respond that Aspnes does not teach that these light beams are used by the ellipsometer and the focusing mirror 72 does not focus probe beams 24 and 26 on the sample (Reply Br. 3-4).

We do not agree. Aspnes clearly teaches that beams 24 and 26 are used by the optical measuring devices including the ellipsometer (FF 3). Although lens 94 and mirror 72 focus the beam from the light source 90 at an oblique angle (FF 6), beams 24 and 26 are, nonetheless, part of the system used by the optical measuring devices and illuminate the sample at a normal angle of incident (FF 3-4). Therefore, we find the Examiner's position reading the claimed "illuminating the specimen at a normal angle of incidence" on the ellipsometer of Aspnes that is configured such that beams 24 and 26 illuminate the specimen at a normal angle to be reasonable. For the reasons discussed above, we sustain the 35 U.S.C. § 102(b) rejection of

claim 6638, as well as claims 6639-6641 which are argued together as one group (App. Br. 8), over Aspnes.

Claim 6643

Appellants argue that Aspnes does not teach or suggest a processor configured to use a thin film characteristic of a specimen to determine a critical dimension since Aspnes does not determine a critical dimension (App. Br. 9). The Examiner refers to the parameters measured by detector 54/56 as the thin film characteristics and argues that the processor uses the measured parameters to determine the film thickness (Ans. 10). Appellants argue that detectors 54 and 56 are not parts of the ellipsometer and therefore, their outputs are not signals generated by the ellipsometer to be used for determining the critical dimension (Reply Br. 4).

Although we agree with Appellants to the extent that the beams received by the detector array 54/56 are not output signals generated by the spectroscopic ellipsometer, we find that Aspnes teaches using the thin film characteristic to determine the critical dimension. In that regard, we find that the spectrometer 58 receives the beams generated by the ellipsometer 18 as the mirror 74 reflects beam 106 (FF 7-8) which is used by the processor 48 for measuring the light intensity reflected from the sample and the ellipsometric parameters of the sample (FF 9). Therefore, the processor 48 is indeed configured to use the thin film characteristic to determine the critical dimension in the form of the film thickness, as recited in claim 6643. Thus, we sustain 35 U.S.C. § 102(b) rejection of claim 6634 over Aspnes.

Claim 6644

Appellants reiterate the contention that the film thickness is not a critical dimension (App. Br. 9), which arguments we found to be unpersuasive as discussed *supra*. Additionally, Appellants argue that Aspnes discloses one system that includes a number of different measurement devices, but not a system that is coupled to a stand alone system (*id.*). The Examiner responds by pointing out that Aspnes' system shown in Figure 1 includes five different measurement devices, wherein each system includes the ellipsometer and is coupled to the larger system (Ans. 10). Appellants respond that these devices are included in the optical measurement system 1 of Aspnes and cannot be considered different systems (Reply Br. 5).

We agree with the Examiner and find that the measurement system 1 in Aspnes includes five different measurement components (FF 2) which are each coupled to the larger system. Aspnes' reference to these five devices as "devices" notwithstanding, each device is in fact a system and is coupled to the larger stand-alone system. Therefore, we find the Examiner's position with respect to characterizing the ellipsometer as a system that is coupled to other measuring device or systems to be reasonable. For the reasons discussed above, we sustain the 35 U.S.C. § 102(b) rejection of claim 6644 over Aspnes.

Claim 6648

Appellants again reiterate the contention that the film thickness is not a critical dimension (App. Br. 9-10), which arguments we found to be unpersuasive as discussed *supra*. Appellants further argue that Aspnes discloses measuring properties of a semiconductor substrate, but provides no

disclosure regarding a substrate, such as a glass substrate, suitable for fabrication of a reticle (App. Br. 10). The Examiner characterizes measuring a substrate with no thin film as a substrate that is suitable for fabrication of a reticle (Ans. 11). Appellants respond that the substrates disclosed in Aspnes are not inherently substrates suitable for fabricating a reticle (Reply Br. 5).

Initially, we note that base claim 6633 recites the specimen as the target of the determinations performed by the system and not as a part of the system. Therefore, to the extent a specimen is recited in claim 6633, claim 6648 merely requires that the system be capable of determining the properties of a specimen such as glass or those that are suitable for fabricating a reticle.

Aspnes discloses that the sample can be any appropriate substrate with no thin film over its surface (FF 8). Therefore, to the extent claimed, we find the Examiner's position with respect to reading the claimed substrate on Aspnes' "any appropriate substrate" to be reasonable. For the reasons discussed above, we sustain the 35 U.S.C. § 102(b) rejection of claim 6648 over Aspnes.

Claim 6651

Appellants rely on the same arguments made with respect to claims 6649 and 6638-6641 in support of patentability of claim 6651 (App. Br. 10), which arguments we found to be unpersuasive as discussed *supra*. Therefore, for the same reasons discussed above, we sustain the 35 U.S.C. § 102(b) rejection of claim 6651 over Aspnes.

2. 35 U.S.C. § 102(e) Rejection of claim 6634 over Stanke

Appellants point out that Stanke cannot anticipate claim 6634 since the reference discloses a processor that is configured to determine a film thickness and argue that a film thickness is not a critical dimension (App. Br. 11-12). For the same reasons stated above with respect to claim 6633, we find that a film thickness represents a "critical dimension" and sustain the 35 U.S.C. § 102(e) rejection of claim 6634 over Stanke.

CONCLUSION

On the record before us, Appellants have failed to show that the Examiner erred in rejecting claims 6633-6651. In view of our analysis above, we affirm the Examiner's decision.

NEW GROUND OF REJECTION

We enter the following new rejections for claim 6652 under the provisions of 37 C.F.R. § 41.50 (b).

Claim 6652 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Aspnes. The claim is reproduced as follows:

> 6652. The system of claim 6649, further comprising a controller computer configured to control a temperature within the track.

The addition of the recited controller computer configured to control a temperature within the track would have been obvious to one of ordinary skill in the art since it is well known by one of ordinary skill in the art that almost all of processing stages of a semiconductor fabrication line require controlling temperature. "[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would

improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1740 (2007). Modifying Aspnes to provide a controller computer to control the temperature within the lithography track is based on common features of such processes and is within the knowledge of skilled artisan.

For the above reasons, we find that claim 6652 recites limitations that are disclosed or suggested by Aspnes. Accordingly, claim 6652 is rejected under 35 U.S.C. § 103(a) over Aspnes.

DECISION

The decision of the Examiner rejecting claims 6633-6651 under 35 U.S.C. § 102 is affirmed. Moreover, we have entered a new ground of rejection under 37 C.F.R. § 41.50(b) for claim 6652 as being unpatentable under 35 U.S.C. § 103(a).

This decision contains a new ground of rejection pursuant to 37 C.F.R. § 41.50(b) (effective September 13, 2004, 69 Fed. Reg. 49960 (August 12, 2004), 1286 Off. Gaz. Pat. Office 21 (September 7, 2004)). 37 C.F.R. § 41.50(b) provides "[a] new ground of rejection pursuant to this paragraph shall not be considered final for judicial review."

37 C.F.R. § 41.50(b) also provides that the Appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

> (1) *Reopen prosecution*. Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the

> examiner, in which event the proceeding will be remanded to the examiner. . . .
> (2) *Request rehearing*. Request that the proceeding be reheard under § 41.52 by the Board upon the same record. . . .

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

37 C.F.R. § 41.50(b)

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